Mathematician's Influential Discoveries

About Author

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LIST OF MATHEMATICIANS

Abraham de Moivre 1667-1754   Abu Jafar Muhammad ibn Musa Al-khwarizmi 780-850   Adrien Marie Legendre 1752-1833   Alexander Grothendieck 1928-2014   Alexis Claude Clairaut 1713-1765   Andrei Nikolaevich Tikhonov 1906-1993   Apollonius 262 BC-190 BC   Archimedes 287 BC-212 BC   August Ferdinand Mobius 1790-1868   Augustin Louis Cauchy 1789-1857   Augustus De morgan 1806-1871   Benoit Mandlebrot 1924-2010   Bernhard Placidus Johann Nepomuk Bolzzano 1781-1848   Bertrand Arthur William Russell 1872-1970   Blaise Pascal 1623-1662   Brahmagupta 598-670   Brook Taylor 1685-1731   Carl Gustav Jacob Jacobi 1804-1851   Charles Hermite 1822-1901   Christiaan Huygens 1629-1695   Claudius Ptolemy 85?-165?   Colin Maclaurin 1698-1746   Daniel Bernoulli 1700-1782   David Hilbert 1862-1943   Diophantus 200?-284?   Elwin Bruno Christoffel 1829-1900   Emmy Amalie Noether 1882-1935   Ernst Friedrich Ferdinand Zermelo 1871-1953   Euclid 325 BC 265 BC   Eudoxus 408 BC-355 BC   Evariste Galois 1811- 1832   Felix Christian klein 1849-1925   Felix Hausdorff 1869-1942   Ferdinand Georg Frobenius 1849-1917   Ferdinand Gotthold Max Eisenstein 1823-1852   Frank Plumpton Ramsey 1903-1930   Francois Viete 1540-1603   Friedrich Wilhelm Bessel 1784-1846   Frigyes Riesz 1880-1956   Gabriel cramer 1704-1752   Georg Ferdinand Ludwig Phillipp Cantor 1845-1918   Georg Friedrich Bernhard Riemann 1826-1866   George Polya 1887-1985   Gian Carlo Rota 1932-1999   Girard Desargues 1591-1661   Girolamo Cardano 1501-1576   Giuseppe Peano 1858-1932   Godfrey Harold Hardy 1877-1947   Gottfried Wilhelm Von Leibniz 1646-1716   Heinrich Franz Friedrich Tietze 1880-1964   Hermann Klaus Hugo Weyl 1885-1955   Heron 10?-75?   Hipparchus 190 BC-120 BC   Hippacratus 470 BC-410 BC   Hugo Dyonizy Steinhaus 1887-1972   Ibn Yanya al-Maghribi Al-Samawal 1130-1180   Jacob Bernoulli 1654-1705   Jacques Salomon Hadamard 1865-1963   James Joseph Sylvester 1814-1897   James Stirling 1692-1770   Jean Baptiste Joseph Fourier 1768-1830   Jean Le Rond dAlembert 1717-1783   Johann Bernoulli 1667-1748   Johann Carl Friedrich Gauss 1777-1855   John Conway 1937-   John Napier 1550-1617   Joseph Liouville 1809-1882   Joseph-Louis Lagrange 1736-1813   Jules Henri Poincare 1854-1912   Julius whelm Richard Dedekind 1831-1916   Karl Herman Amandus Schwarz 1843-1921   Karl Theodor Wilhelm Weierstrass 1815-1897   Kazimierz Kuratowski 1896-1980   Leonardo Pisano (Fibonaci) 1170-1250   Leonhard Euler 1707-1783   Maria Gaetana Agnesi 1718-1799   Marin Mersenne 1588-1648   Nicolo Fontana (Tartaglia) 1499-1557   Nicolaus Bernoulli 1687-1759   Nicolaus Copernicus 1473-1543   Nicole d oresme 1323-1382   Nicomachus 60?-120?   Niels Henrik Abel 1802-1829   Nikolai Ivanovich Lobachevsky 1792-1856   Omar Khayyam 1048-1131   Pafnuty Lvovich Chebyshev 1821-1894   Paolo Ruffini 1765-1822   Pappus 290?-350?   Paul Erdos 1913-1996   Pirre de Fermat 1601-1665   Pirre-simon Laplace 1749-1827   Plato 427-347 BC   Pythagoras 569-475 BC   Rene Descartes 1596-1650   Simeon Denis Poisson 17811840   Sir Isaac Newton 1643-1727   Sir Ronald Aylmer Fisher 1890-1962   Sir William Rowan Hamilton 1805-1865   Srinivasa Aiyangar Ramanujan 1887-1920   Stanislaw Marcin Ulam 1909-1984   Stefan Banach 1892-1945   Stephen Smale 1930-   Thales 624 -747 BC   Theatetus 417-369 BC   Thomas Jan Stieltjes 1856-1894   Waclaw Sierpinski 1882-1969   Wihelm Ackermann 1896-1962   William Paul Thurston 1946-2012   Zeno

490-425 BC

Abraham de Moivre 1667-1754

The Doctrine of Chance. Theory of annuities. Stirlings formula. Dearrangement problem. Gramblers ruin problem.

Abu Jafar Muhammad ibn Musa Al-khwarizmi 780-850

Hisab al-jabr walmugabala. The father of algebra.

Adrien Marie Legendre 1752-1833

Legendre functions. Legendre polynomial. Law of quadratic reciprocity for residues. Legendre theorem on Spherical triangle. Elements de geometrie. Least squares method. Major work on elliptic functions (3-volume). Volume I -elliptic Integral. Volume II Gamma and Beta functions. Volume III- Tables of elliptic integral functions.

Alexander Grothendieck 1928-2014

Seminaire de Geometrie. Theory of schemes. Contribution: Topological tensor. Products and nuclear spaces. Sheaf cohomology as derived functors. Schemes. k-theory. Grothendieck-Riemann Roch. Topoi.

Alexis Claude Clairaut 1713-1765

Calculus . Analytical Geometry. LHospitals book. Double Curvature Curves. Calculus of variation. Geodesics of quadrics of rotation. Clairauts differential equation. Gave singular solution in addition to the general integral of the equation. Integral calculus . Proving Existence of I.F for I-order D.E. Three body problem. Solution of equation of degree four. Published: A book on algebra, geometry .

Andrei Nikolaevich Tikhonov 1906-1993

Conditions for a topological space. Tikhonov topology. Thesis on functional equations of Volterra type. Fixed point theorem.

Apollonius 262 BC-190 BC

Conics 8 books. Developed the hemicyclium.

Archimedes 287 BC-212 BC

Invented compound pulley. Methods of integration. Method of exhaustion is the early form of integration . Accurate approximation to π. He could approximate square root accurately. Invented a system for expressing large numbers. Archimedes principle. Semi-regular polyhedral. Extocius brought out editions of some of Archimedess work.

August Ferdinand Mobius 1790-1868

Thesis: The occultation of fixed stars. Habilitation thesis on Trigonometrical equation. Wrote a work concerning occutations of the planets. Crelles Journal. Analytical geometry. Projective and affine geometry. Homogeneous coordinates. Projective transformations. Mobius net. Mobius function. Mobius band. Mobius inversion formula. Geometric treatment of statics. Variant of the Four color problem.

Augustin Louis Cauchy 1789-1857

Proved: The angles of a convex polyhedron are determined by its faces. Paper on polygons, polyhedra. He published the memoir on definite integral that later become the basis of his theory of complex functions.. Symmetric functions. Paper: Solving one of Fermats claims on polygonal numbers made to mersenne. Lectured on methods on integration which he discovered earlier. The conditions for convergence of infinite series. Published: Study of the Calculus of residues. paper: he defined for the first time a complex function of a complex variable. Differential equation . 4 volume text. Cauchy integral theorem. Cauchy kovalevskaya existence theorem. Cauchy Riemann equations. Cauchy distribution . Cauchy sequence. Produced 789 paper.

Augustus De morgan 1806-1871

Elements of Arithmetic. Published : Trignometry and Double Algebra. Introduced : Mathematical induction . De Morgans law. Co-founder of LMS.

Benoit Mandlebrot 1924-2010

Discovered : Mandlebrot set. Fractal. The fractal geometry of nature. Bernhard Hermann Neumann . Automorphism group of a free group. Varieties of groups. Finite basis problem can each variety defined by a finite set of laws?.

Bernhard Placidus Johann Nepomuk Bolzzano 1781-1848

Prepard a doctoral thesis on geometry. Papers: foundations of mathematics. Free calculus . Gave proof: Intermediate value theorem. A complete theory of science and knowledge. Paradoxes of the infinite. He gave a function which is nowhere differentiable yet everywhere continuous.

Bertrand Arthur William Russell 1872-1970

Wrote: Introduction to mathematical philosophy. Released the Russell-Einstein manifesto. Russell paradox. Whitehead and Russell were able to provide detailed derivations of many major theorems in set theory, finite and transfinite arithmetic and elementary measure theory. Russell logicismn. One of the founder of analytic philosophy.

Blaise Pascal 1623-1662

Discovered : Sum of the angles of a triangle are two right angles. Paper: Projective geometry. Pascals mystic hexagon. Published : work on conic sections. Invented : First digital calculator. Pressure of the atmosphere decreases with height. Pascals law of pressure. Pascal was not the first (Pascal triangle). His work on binomial coefficient leads Newton to discover the general binomial theorem for fractional and negative power. Last work : on cycloid. Finding its centre of gravity. Surface area of its solid revolution. Its arc length.

Brahmagupta 598-670

Brahmasphutasiddhanta (The opening of the Universe) in 628. Algorithm for computing square roots, it is equivalent to Newton Raphson iterative formula. Methods to solve quadratic equations. Used the method of continued fractions to find the Integral solutions of Linear indeterminate equations. Solved some quadratic indeterminate equations. Rules for summing series. $1^2 + 2^2 + 3^2 + + n^2 =$. $1^3 + 2^3 + 3^3 + + n^3 =$. Gave formulas for the area of a cyclic quadrilateral and for the lengths of the diagonals in terms of the sides.

Brook Taylor 1685-1731

Paper : solution to the problem of the centre of oscillation of a body. Published : 13 articles on optics as diverse as describing experiments in capillary action magnetism and thermometers . Found : improving method for approximating the roots of an equation (New method). Two books appeared in 1715. In one book, added a new branch (calculus of finite differences). Invented : Integration by parts. Discovered : Taylors expansion. Singular solutions to D.E. A change of variables formula. A way of relating the derivative of a function to the derivative of the inverse function. Discussion on vibrating strings. First general treatment of vanishing points.

Carl Gustav Jacob Jacobi 1804-1851

Undertaking research on his own attempting to solve quintic equations by radicals. Paper : Iterated functions. Proved : if a single valued function of one variable is doubly periodic then the ratio of the periods is imaginary. Global theory of curves. The spherical image of the normal directions along a closed differentiable curve in space divides the unit sphere into regions of equal area. Discoveries : in number theory. Remarkable new ideas about elliptic functions. Research : PDE of I-order applied to D.E of dynamics. Worked : determinants. Functional determinants. Proved : if a set of n functions in n variables are functionally related then the Jacobian is identically zero. While if the functions are independent the Jacobian can not be identically zero.

Charles Hermite 1822-1901

Discovered : some D.E satisfied by theta-functions. Contribution: number theory . Algebra. Orthogonal polynomial. Elliptic functions. Theory of quadratic form. Proved : doubly periodic functions can be represented as quotients of periodic entire functions. Found: reciprocity law relating to binary form. Quadratic form + invariant theory = theory of transformations. Results on this topic provided connections between number theory, theta functions and transformations of abelian functions. Although an algebraic equation of the fifth degree can not be solved in radicals, a result which was proved by Ruffini and Abel, Hermite showed in 1858 that an algebraic equation of the fifth degree could be solved using elliptic functions. 1873 published :first proof e is a transcendental number. Using similar method, Lindemann established in 1882, pi also. Hermite polynomial. Hermites differential equation. Hermites formula of interpolation. Hermitian matrices.

Christiaan Huygens 1629-1695

First publications in 1651 and 1654 considered the fallacy in methods proposed to square the circle. Using one of his own lenses, detected in 1655, the first moon of Saturn. Discovered : true shape of the rings of Saturn. Wrote a small work on the calculus of probabilities, the first printed work on the subject. 1656 patented the first pendulum clock. Build several pendulum clocks to determine longitude at sea. Derived the law of centrifugal force for uniform circular motion. As a result of this he, Hooke, Halley and wren formulated the inverse-square law of gravitational attraction. Work on the collision of elastic bodies showed the error of Descartes law of impact. Experiementally verified the law of conservation of momentum. Published : a book on physics in 1673. In it he solves the problem of compound pendulum. Describes the descent of bodies in a vacuum. Defines evolutes and involutes of curve. Finds the evolutes of the cycloid and of the parabola. In a 1678 paper, argued in favor of a wave theory of light. Also worked on the velocity of light, which he believed was finite, and was pleased to of Romers experiements which gave an approximate velocity for light determined by observing Jupiters moon. Greatest mechanist of the 17-th century.

Claudius Ptolemy 85?-165?

Almagest 13 books. Epicycles. Using chords of a circle and an inscribed 360 gon, the approximation $\pi = 3 + \frac{17}{20} = 3.14166$. Solstices and equinoxes. Found : lengths of the seasons. Major work Geography written in 8 books. A book on astrology. A book on the construction of sundials. A book about the stereographic projection of the celestial sphere onto a plane.

Colin Maclaurin 1698-1746

Study of the tides. Published : 2-volume Treatise on fluxions. Fundamental theorem of calculus. Work on maxima and minima. The attraction of ellipsoids . Elliptic integrals . Euler-Maclaurin summation formula. Integral test for the convergence of an infinite series. Annular eclipse of the sun in 1737. The structure of bees honeycombs . Maclaurins Treatise on algebra was published 2-year after his death.

Daniel Bernoulli 1700-1782

1720 dissertation on the mechanics of breathing. Faro. A game of chance. Flow of water from a hole in a container . Riccati D.E. Figures bounded by two arcs of a circle. Hydrodynamics, a term he invented . Hydrodynamics book 1738. Best shape for a shipss anchor. Essay on magnetism. Method to determine time at sea. Essay on ocean currents. Effects of forces on ships. Proposals to reduce the pitching and tossing of a ship in high seas. Theory of oscillations. Oscillation of air in organ pipes.

David Hilbert 1862-1943

First work on invariant theory. Proved : Basis theorem. Worked : a book on algebraic number theory. Famous speech , the problems of Mathematics to the second International Congress of Mathematicians in Paris. Presented 23 unsolved problems. Continuum hypothesis. The well ordering of the reals. Goldbach conjectures. The transcendence of powers of algebraic numbers. Extension of Dirichlets principle. Contribution : invariants. Algebraic number fields. Functional analysis. Integral equations. Mathematical physics. Calculus of variants. Hilbert space. Kinetic gas theory. Theory of radiations.

Diophantus 200?-284?

Arithmetica (collection of 130 problems). Gives numerical solutions of both determinate and indeterminate equations. Diophantine analysis(13 books). Diophantus solves problems of finding values which make two linear expressions simultaneously into squares and cubes. 4n+3 can not be the sum of 2-squares. Every number can be written as the sum of 4-squares. Fermat stated but not given proof. Lagrange proved using Euler result. Lemma : $a^3 - b^3 = c^3 + d^3$.

Elwin Bruno Christoffel 1829-1900

Dissertation on motion of electricity in homogeneous bodies. Two paper : on numerical integration. Christoffels theorem. Paper : function theory including. Conformal mapping . Geometry. Tensor analysis. Riemanns o-function. Theory of invariants. Orthogonal polynomials. Continued fractions. Differential equations. Potential theory. Light. Shock waves. Published : paper on the propagation of plane waves in media a surface discontinuity. 6-paper on invariants. Some paper →development of the tensor calculus. Christoffel reduction theorem. Solves the local equivalence problem for two quadratic differential forms.

Emmy Amalie Noether 1882-1935

Theoretical physics (Noethers Theorem). Proves a relationship between symmetries in physics and conservation principles. Work in the theory of invariants led to formulations for several concepts of Einsteins general theory of relativity. Ideal theory . Producing an abstract theory

which helped develop ring theory. This paper was of fundamental importance in the development of modern algebra. Gave : decomposition of ideals into intersections of primary ideals in any commutative ring with ascending chain condition. Lasker had already proved this result for polynomial rings. Van der waerden wrote his book Modern algebra. Major part of 2-volume consists of Noethers work. 1927 collaborated with Hasse and Brauer in work on non-commutative algebras.

Ernst Friedrich Ferdinand Zermelo 1871-1953

Dissertation on calculus of variations. Extended weierstrasss method for the extrema of integrals over a class of curves to the case of integrands depending on derivatives of arbitrarity high order. Careful definition of the notion of neighbourhood in the space of curves. Hydrodynamics. Cantor had put forward the continuum hypothesis in 1878, conjecturing that every infinite subset of the continuum is either countable or has the cardinality of the continuum. Set theory, in particular taking up Hilberts idea to head towards a revolution of the problem of the continuum hypothesis. 1902 published work on set theory, on the addition of transfinite cardinals. Proved : every set can be well ordered . Axiomatic set theory. 1908, published his axiomatic system containing 7 axioms despite his failure to prove consistency.

Euclid 325 BC 265 BC

Elements (13 books). Book(1-6)-plane geometry. Book(7-9)-number theory. Book10 theory of irrational numbers mainly work of Theaetetus. Book (11-13)-3D geometry. Wrote book: Data. Divisions. Optics. Phaenomena.

Eudoxus 408 BC-355 BC

Contribution : theory of proportion. Pythogorean discover irrationals. Work : on integration using his method of exhaustion. Volumes of cones. Pyramides. Archimedes use Eudoxus method of exhaustion to prove theorem. Eudoxuss planetary theory. Book : on geography (7 books).

Evariste Galois 1811- 1832

1829 first paper on continued fraction submitted articles on the algebraic solution of equations. Posthumous article by Abel. 1830 published 3 paper in elliptic functions elliptic integrals. 1846 Galois theory published in Liouville Journal .

Felix Christian klein 1849-1925

In his dissertation klein classified second degree line complexes using weiertrasss theory of elementary divisors. Crelles journal specialized in complex analysis, algebraic geometry and invariant theory. Klein and Lie discovered the fundamental properties of the asymptotic lines on the kummer surface. 1871 published 2-paper on non-euclidean geometry. In which, showed non Euclidean geometry was consistent iff Euclidean geometry was consistent. Work : function theory. 1882 paper treats function theory in a geometric way connecting potential theory and conformal mapping. Interested using transcendental methods to solve the general equation of the fifth degree. Solve problem using the group of the icosahedron. Developed theory of automorphic functions. Wrote : 4 volume on automorphic and elliptic modular functions. Klein bottle.

Felix Hausdorff 1869-1942

Main work : topology. Set theory. Introduced : the concept of a partially ordered set. Attempt to prove cantors continuum hypothesis. Proved : results on the cardinality of Borel sets in 1916. Created : theory of topological and metric spaces. Introduced : Hausdorff dimension (called fractal geometry). Hausdorff measure. Term metric space.

Ferdinand Georg Frobenius 1849-1917

Weierstrass and Fuchs list 15 topics on which Frobenius had major contributions : The development of analytic functions in series. The algebraic solution of equations whose coefficients are rational functions of one variable. The theory of linear D.E. Pfaffs problem. Linear forms with integer coefficients. Linear substitutions and bilinear forms. Adjoint linear differential operators. The theory of elliptic Jacobi functions . The relations among the 28 double tangents to a plane of degree 4 . Sylow theorem. Double cosets arising from two finite groups. Jacobis covariants. Jacobi functions in three variable. The theory of biquadratic forms. The theory of surfaces with a differential parameter . On finite groups, he proved sylows theorem for abstract groups. Continued his investigation of conjucacy classes . Published 5 paper on group theory and one of them on group characters is of fundamental importance. 1897-1899 published 2 paper on group representations, one on induced characters one on tensor product of characters. 1898 introduced : induced representation . Frobenius Reciprocity theorem. 1896 gave the irreducible characters for the alternating groups A_4, A_5, the symmetric groups S_4, S_5 and the group PSL(2,7). Character theory of groups. Frobenius groups. Positive and non-negative matrices. Introduced : the concept of irreducibility for matrices.

Ferdinand Gotthold Max Eisenstein 1823-1852

He began by learning the differential and integral calculus from the works of Euler and Lagrange. Hamilton gave him a copy of a paper that he had written on Abels work. Submitted paper on cubic forms with two variables. 1844 published 23 papers and 2 problems . Even Gauss was impressed . Worked: on theory of forms. Higher reciprocity laws. Disquisitions arithmetica. Contribution : theory of elliptic functions.

Frank Plumpton Ramsey 1903-1930

1925 Published first paper The foundations of Mathematics. 1930 Paper : on a problem of formal logic methods for determining the consistency of a logical formula. Some theorems on combinatorics led to Ramsey theory. Two paper : A contribution to the theory of taxation. A mathematical theory of saving.

Francois Viete 1540-1603

1591 published book : In artem analyticam isagoge. Improvement : theory of equations. Presented methods for solving equations of second, third and fourth degree. He knew the connection between the positive roots of equations and the coefficients of the different powers of the unknown quantity. The word coefficient is actually due to viete. Wrote books on trigonometry and geometry, gave geometrical solutions to doubling a cube and trisecting an angle and the construction of the tangent at any point on an Archimedian spiral. Calculated pi to 10 places using a polygon of 393216 sides. Represented pi as an infinite product for the first time.

Friedrich Wilhelm Bessel 1784-1846

His interests turned towards navigation and he considered the problem of finding the position of ship at sea. Began to make observations to determine longitude. 1804 published a paper on Halleys comet. He used Bradleys data to give a reference system for the positions of stars and planets. He had to deduce errors in Bradleys instruments and errors caused by refraction. He had to reduce the positions to one fixed data and eliminate the effects of the Earths motion, the precession of the Earth and other effects. Work : determining the constants of precession, nutation and aberration. Undertook his monumental task of determining the positions and proper motions of over 50,000 stars. From periodic variations in the proper motions of Sirius and Procyon, Bessel deduced that they had companion stars in orbit which had not been observed. 1841 He announced that Sirius had a companion, thus being the first to predict the existence of dark stars. Bessel functions. Interest in these functions Arose in the treatment of the problem of the perturbation in the planetary system. Contribution : to geodesy include a correction in 1826 to the second pendulum. The length of which is precisely calculated so that it requires exactly one second for a swing. 1841 deduced a value of $\frac{1}{299}$ for the ellipticity of the Earth, the amount of elliptical distortion by which the Earths shape depends from a perfect sphere.

Frigyes Riesz 1880-1956

Doctoral dissertation was on geometry . Founder of functional analysis. 1907,1909 produced representation theorem for a functional on quadratic Lebesgue integral functions and in terms of a Stieltjes integral. Introduced : the shape of q-fold. Lebesgue integrable function. Weak

convergence of a sequence of functions. Work of 1910 marks the start of operator theory . 1918 his work came close to an axiomatic theory for Banach spaces. Publish : Egorovs theorem on linear functionals. Riesz-Fischer theorem. 1907 proved fundamental in the Fourier analysis of Hilbert space. Basis for proving that matrix mechanics and wave mechanics were equivalent. This is of fundamental importance in early quantum theory. Contribution : ergodic theory. In 1938 gave: mean ergodic theorem. Book : functional analysis.

Gabriel cramer 1704-1752

Thesis : theory of sound . Published : geometric problems . Aurora borealis. Correspondence between Johann Bernoulli and Leibniz. Edited : 5 volume work by Christian wolff. Book : Introduction a lanalyse des lignes courbes algebraigue. Cramers rule. Castillon cramer problem. Cramers paradox.

Georg Ferdinand Ludwig Phillipp Cantor 1845-1918

Received doctorate in number theory. One of his senior colleagues, who challenged cantor to prove the open problem on the uniqueness of representation of a function as a trigonometric series. 1870-cantor solved the problem. Published : trigonometric series(Dedekind cuts). Proved : Rational numbers and algebraic numbers are countable. (real number were not countable) in this paper the idea of a 1-1 correspondence appears for the first time. 1877 proved : there was 1-1 correspondence of points on the interval [0,1] and points in d-dimensional space. 1879-1884 published : series of 6-paper to provide a basic introduction to set theory. 5th paper presented of the transfinite numbers as an autonomous and systematic extension of the natural numbers. Last paper is on set theory (1895 and 1897). Second paper describes his theory of well ordered sets and ordinal number. All even number up to 1000 could be written as the sum of two primes.

Georg Friedrich Bernhard Riemann 1826-1866

He lent Bernhard Legendres book on the theory of numbers, Riemann read the 900 page book in 6 days. Riemanns thesis studied the theory of complex variables (Riemann surfaces). It introduced topological methods into complex function theory. Gave : the conditions of a function to have an integral (condition of Riemann integrability). Solved general inversion problems. Number of primes less than a given magnitude. Riemann extended the zeta function to complex values. Riemann hypothesis.

George Polya 1887-1985

1918 published papers : on series. Number theorem . Combinatorics. Voting systems. Astronomy. Probability. Integral functions. He gives wise advise if you cannot solve a problem, then there is an easier problem you cannot solve: find it. Proved : theorem on random walks. 1937 contribution : Polya enumeration theorem (in combinatorics).

Gian Carlo Rota 1932-1999

Worked : on functional analysis. On operator theorem. 1959-1960 : 2-paper on ergodic theorem.

Girard Desargues 1591-1661

Invented : projective geometry. 1648 published : perspective theorem.

Girolamo Cardano 1501-1576

Book : 2-book. For 6-years, Cardano worked on solving cubic and quartic equations by radicals. 1545 published : Ars Magna. Two encyclopaedias of natural sciences.

Giuseppe Peano 1858-1932

Course in Infinitesimal calculus . 1886 proved : if $f(x,y)$ is continuous then the 1st order D.E $\frac{dy}{dx} = f(x,y)$ has a solution. Showed :solutions were not unique. Published : a method for solving systems of linear D.E using successive approximations. 1888 published book : Geometrical Calculus. This book contains the first definition of a vector space with a modern notation and style. 1889 published : Peano axioms. 1890 invented : space filling curves. Formulario Mathematica (calculus volume).

Godfrey Harold Hardy 1877-1947

Paper : convergence of series, integrals allied topics. 1908 published : A Course of Pure Mathematics. 1913 received Ramanujans first letter . They wrote 5 papers together. Interests : (Pure Mathematics). Diophantine analysis. Summation of divergent series . Fourier series. The Riemann zeta function. Distribution of primes. He had proved the Riemann hypothesis. 1940 book : A Mathematicians apology.

Gottfried Wilhelm Von Leibniz 1646-1716

1671 published work in which he claims that movement depends on the action of a spirit. Work : on dynamics. 1675 wrote a manuscript using the integral notation for the first time. In the same manuscript the product rule for differentiation is given. 1676 discovered : power rule for both integral and fractional exponents. Achievement : development of the binary system of arithmetic. 1684 published details of his differential calculus. The paper contained : differential notation. Rules for computing derivative of powers . Products and Quotients. 1686 published paper dealing with integral calculus.

Heinrich Franz Friedrich Tietze 1880-1964

Thesis : Topological invariants. Contributed : foundations of general topology. Developed : subdivisions of all cell complexes . Invented : Tietze transformations (fundamental groups are topological invariants). Worked : knot theory. Jordan curves. Continuous mapping of areas. Map coloring. Book : Famous problems of Mathematics. Worked : ruler and compass construction. Continued fractions . Partitions. Distribution of prime numbers. Differential geometry.

Hermann Klaus Hugo Weyl 1885-1955

Geometric function theory developed by Riemann. 2-dimensional differentiable manifold a covering surface. Duality between differentials and 1-cycles. Weyl metrice, led to a gauge field theory. Contribution : uniform distribution of numbers modulo 1 which are fundamental in analytic number theory. He attempted to incorporate electromagnetism into the geometric formalism of general relativity. Produced : The first unified field theory for which the Maxwell electromagnetic field and the gravitational field appear as geometrical properties of space time with his application of group theory to quantum mechanics.

Heron 10?-75?

One of his books contains a chapter on astronomy, giving a method to find the distance between Alexandria and Rome using the difference between local times at which an eclipse of the moon is observed at each city. His treatise Metrica contains 3 volumes. Proved : Herons formula. If A is a area of a triangle with sides a,b,c and $s = \frac{(a+b+c)}{2}$ then $A_2 = s(s-a)(s-b)(s-c)$. A method for finding the cube root of a number. Wrote a important treatise on mechanics. They give methods of lifting heavy weights and describe simple mechanical machines.

Hipparchus 190 BC-120 BC

Even if he did not invent it, Hipparchus is the first person whose systematic use of trigonometry we have documentary evidence. Introduced : The division of a circle into 360 degrees into Greece. Produced : table of chords. Trigonometric table. He did this by using the supplementary angle theorem, half angle formulas, linear interpolation. Hipparchus calculated the length of the year to within 6.5 minutes. Discovered : Precession of the equinoxes. Made : careful study of the motion of the moon. Gave : a range of values within which be calculated that the true distance must lie. Estimated that eclipse have a period of 126007 days. Hipparchuss calculation led him to a value for the distance to the moon of between 59 and 67 earth radii, quite remarkable in that the correct distance is zero earth radii. Hipparchus was also able to give an epicycle model for the motion of sun, but did not attempt to give an epicycle model for the motion of the planets.

Hippacratus 470 BC-410 BC

Worked : squaring the circle and doubling the cube. In his attempts to square the circle, Hippocrates was able to find the areas of lunes, certain crescent-shaped figures, using his theorem that the ratio of the areas of two circles is the same as the ratio of the squares of their radii. Showed : a cube can be doubled if two mean proportionals can be determined between a number and its double. First known geometer to write a geometry book. Book : also included geometrical solutions to quadratic equations and early methods of integration.

Hugo Dyonizy Steinhaus 1887-1972

Studied Lebesgues two major book. Concentrated on functional analysis and its diverse applications . The general theory of orthogonal series . The probability theory. Published : theory of tossing coins. Basedon measure theory. 1925 first to define and discuss the concept of strategy in game theory. 1929 togather with Banach started a new journal studia Mathematica. The theory of orthogonal series. 1944 Steinhaus proposed the problem of dividing a cake into n pieces so that it is proportional and envy free. Envy free solution for n=3 was found in 1962 by John H.Conwy and independently by John Selfridge. He gave an example of trigonometric series which diverged at every point, yet its coefficients tended to zero. He also gave an example of a trigonometric series which converged in one interval but diverged in a second interval. He was the first to make precise the concept of independent and uniformly distributed. 1937 book : Mathematical Snapshots.

Ibn Yanya al-Maghribi Al-Samawal 1130-1180

The treatise consists of 4-books. Book 1 : Defines integer power of variable . After defining polynomials, he describes addition, subtraction, multiplication and division of polynomials. Gave : methods or the extraction of the roots of polynomials. Book 2 : Describes the theory of quadratic equations. Gave geometric solutions to these equations. Also describes the solution of indeterminate equations. His description of the binomial theorem where the coefficients are given by the Pascal triangle. $1^2 + 2^2 + 3^2 + + n^2 = \frac{n(n+1)(2n+1)}{6}$. Final book : problem in combinatorics . Namely to find 10 unknowns given the 210 equations which give the sums taken 6 at a time. Of course such a system of 210 equations need not be consistent and he gave 504 conditions which are necessary for the system to be consistent.

Jacob Bernoulli 1654-1705

Interested : Infinitesimal geometry. Contribution : 1685 on the parallels of logic and algebra. 1685 algebra. 1687 geometry. Geometry result : construction to divide any triangle into four equal parts with two perpendicular lines. 1689 infinite series. Law of large numbers in probability theorem . Published : (1682-1704) 5-Treatise on infinite series. In 2-of these (5-treatise) $sum\frac{1}{n}$ diverges . He believed were new but proved 40-years earlier. $sum\frac{1}{n^2}$ converges to a finite limit less than 2 . Euler was the first to find the sum of this series $\pi^{\frac{2}{6}}$. Studied : exponential series came out of examining compound interest. 1690 published : In Acta

Eruditorum. Showed : The problem of determining the isochrones is equivalent to solving a first-order nonlinear differential equation . The isochrones, or curve of constant descent, is the curve along which a particle will descent under gravity from any point to the bottom in exactly the same time, no matter what the starting point. 1696 Bernoulli solved equation(Bernoulli equation). $Y = p(x)y + g(x)y^n$. Discovered : general method to determine evolutes of a curve as the envelope of its circles of curvature. Caustic curves. Curves of a parabola. Logarithmic spiral. Epicycloids . Drawbridge problem [curve is required so that the cable always keeps the drawbridge balanced. Bernoulli numbers appear in the book in a discussion s of exponential series.

Jacques Salomon Hadamard 1865-1963

Research : investigating the problem of finding an estimate for the determinants generated by coefficients of a power series. Thesis : 1892 on functions defined by Taylor series. Paper : number of primes less than a given number. Published : 29 papers. 1896 prime number theorem. Contribution : geometry, dynamics. 1893 published : determinants inequality. Hadamard matrices. Coding theory. Writing several papers on probability in particular on Markov chains. Wrote almost 300 papers.

James Joseph Sylvester 1814-1897

He did important work on Matrix Theory. 1851 Discovered : discriminant of a cubic equation. Used matrix theory to study higher dimensional geometry . Contributed : Creation of the theory of elementary divisors of lambda matrices.

James Stirling 1692-1770

1717 published : First work which extends Newtons theory of plane curves of degree 3, adding four new types of curves to the 72 given by Newton. There are results on the curve of quickest descent, the catenary and orthogonal trajectories. 1730 published: Methods Differentialis. This book is a treatise on infinite series, summation, interpolation and quadrature. The asymptotic formula for n! for which Stirling is best known appears as Example 2 to Proposition 28. Gave theorem to treat convergence of an infinite product. 1733 read paper to RSL entitled Twelve propositions concerning the figure of the Earth. Stated without proof, that the Earth is an oblate spheroid, supporting cassinian view. 1745 published a paper on the ventilation of mine shafts.

Jean Baptiste Joseph Fourier 1768-1830

Paper : on algebra. 1804 work : on the theory of heat . 1808 Fourier expansions of functions as trigonomical series [Fourier Series]. 1807 memoir together with additional work on the cooling of infinite solids and terrestrial and radiant heat.

Jean Le Rond dAlembert 1717-1783

He read his first paper on some errors he had found in Reyneaus standard text. 1740 work on the mechanics of fluid . Paper on integral calculus. He worked on the encyclopedia, wrote mathematical articles in this 28 volume. 1747 published an article on vibrating string. Defined the derivative of a function as the limit of a quotient of increments. DAlemberts ratio test. 1753 and 1767 5 volume.

Johann Bernoulli 1667-1748

De LHospital Calculus. 1694 considered the function $y = x^x$. Investigated series using the method of integration by parts. Discovered : addition theorems for trigonometric and hyperbolic functions using the differential equations. Solved : problem of catenary. Proposed and solved : the problem of brachristochrone. 1696 proposed : Isoperimetric problem.

Johann Carl Friedrich Gauss 1777-1855

Discovered : Bodes law. Binomial theorem. Arithmetic-geometric mean. Law of quadratic reciprocity. Prime number theorem. Dissertation : fundamental theorem of algebra. Published : number theory book. 1801 Disquisitions Arithmeticae. 1801 used least squares to predict the orbit of Ceres. 1809 published : book 2. 2 volume : motion of celestial bodies. Volume I : Differential equations. Conic sections. Elliptic orbits. Volume II : estimation of planets orbit. Introduction of hyper geometric function work concerned with potential theory. Carried out a geodesic survey of the state of Hanover. Invented : heliotrope. 1823 published papers : on the least square method. 1828 Gauss Potential theorem. Least square method . 1832 He and Weber investigated the theory of terrestrial magnetism.

John Conway 1937-

Leech Lattice. Discovered : Surreal numbers . Article: on numbers and games. Winning ways for your mathematical plays. Sphere packings. Lattices and groups. The book of numbers . On Quaternions and octomions. Symmetries of things.

John Napier 1550-1617

Invention : logarithm. Napiers logarithms are not really to any base. Briggs had suggested to Napier that log should be to base 10. Napier suggested log 1 should be zero. Briggs later made tables. Described a method of multiplication using number rods. Contribution : spherical triangle. Laplace 200 year later , said that logarithms, by shortening the labors, doubled the life of the astronomers.

Joseph Liouville 1809-1882

Paper : on electro-dynamics. PDE. Theory of heat. 1836 founded Journal de Mathematiques pures et Appliquees. One of the first topics he studied, which developed from his early work on electromagnetism, was a new topic called fractional calculus. Investigate the general problem of integration of algebraic functions. His work at first was independent of that of Abel. Worked : transcendental number. Constructed : an infinite class of transcendental numbers using continued fractions. Liouvillie number 0.11000100000000000000010000 Where there is a 1 in place n! and 0 elsewhere. Work : on boundary value problems on differential equations. Sturm-Liouvillie theory. Sturm and Liouvillie examined general linear second order D.E and examined properties of their eigen values, the behavior of the eigen. functions and the series expansion of arbitrary functions in terms of these eigen functions. Liouvillie contributed to differential geometry studying conformal transformations. Proved : theorem concerning the measure preserving property of Hamiltonian dynamics. In number theory, Liouvillie wrote around 200 papers, quadratic reciprocity. Wrote over 400 papers in total.

Joseph-Louis Lagrange 1736-1813

1754 published work on an analogy between the binomial theorem and the successive derivatives of the product of functions. Work : tautochrone. Some important discoveries which would contribute substantially to the new subject of the calculus of variations. 1756 He generalized results which Euler had himself obtained in calculus of variations. Short work on : calculus of probabilities. In a work on the foundations of dynamics, Lagrange based his development on the principle of least action and on kinetic energy. Major study: on the propagation of sound . Contribution : theory of vibrating string . Used a discrete mass model for his vibrating string, which he took to consist of n masses joined by weightless strings. Solved : resulting system of n+1 D.E, then let n get large to obtain a functional equation. Lagrangian function [fluid mechanics]. Problem to which he applied his method was the study the orbits of Jupiter and Saturn. 1772 shared with Euler 3-body problem. 1780 orbits of comets by the planets. Covered many topics: Stability of the solar system. Mechanics. Dynamics. Fluid mechanics. Probability and foundations of calculus. Worked : number theory. 1770 proving every integer is the sum of four squares. 1771 proved : wilsons theorem . 1770 presented an important work which made a fundamental investigation of degrees up to 4 could be solved by radicals. Studied : permutations of the roots. Mechanique analytique →fluid mechanics. Lagrange published 2 volumes of his calculus lectures. 1797 published first theory of functions of a real variable . Theorie des functions analytique.

Jules Henri Poincare 1854-1912

Developed : concept of automorphic functions which he used to solve second order linear D.E with algebraic coefficients. 1895 published : Analysis situs. Early systematic treatment of topology. Studied : optics, electricity, telemetry, capillarity, elasticity, thermodynamics, potential theory, quantum theory, theory of relativity and cosmology. Three body problem . Theory of light . Electromagnetic waves. 3-body problem were convergent. Chaotic dynamics began 1963. Julia Bowman Rabinson. Work : on Hilbers 10th problem.

Julius whelm Richard Dedekind 1831-1916

Dedekind took a course given by Guass on least action . Thesis : Theory of Eulerian integrals . Abelian functions . Elliptic functions. He applies his theory of ideals to the theory of Riemann surfaces. This gave proof of the Riemann-Roch theorem. 1879 published : Uber die Theorie der ganzen algebraischen zahlen.

Karl Herman Amandus Schwarz 1843-1921

Worked : on conformal mapping of polyhedral surfaces on to the spherical surface. Alternative method for solving Dirichlet problem. Worked : on minimal surfaces, a characteristic problem of the calculus of variations. Answered : The equation of whether a given minimal surface really yields a minimal area. The idea in this work led Emile Picard to his existence proof for solutions of D.E. It also contains the inequality for integrals now known as the Schwarz inequality.

Karl Theodor Wilhelm Weierstrass 1815-1897

1814 and 1842 3-short paper on : his theory of complex variable. 1854 published paper: on abelian functions. Published : a full version of hyper-elliptic integrals. 1856 Discovered: function that although continues, had no derivative at any point. 1863 proved : complex numbers are the only commutative algebraic extension of the real numbers. 1831 Gauss had promised a proof of this but had failed to give one.

Kazimierz Kuratowski 1896-1980

Showed : a graph is planar iff it does not contain a sub-graph. Homeomorphic to either k_5 or $k_(3,3)$.

Kurt Godel 1906-1978

1931 Godels incompleteness theorem. Proved : fundamental results about axiomatic systems showing in any axiomatic mathematical system there are propositions that cannot be proved or disproved within the axioms of the system. Gave lecture : on un-decidable propositions of formal mathematical systems. His work consistency of the axiom of choice and of the generalized. 1940 continuum hypothesis with the axioms of set theory.

Leonardo Pisano (Fibonaci) 1170-1250

Book : Liber abbaci (1202). Practica geometriae (1220). Flos (1225). Liber quadratorum (1225). Book of squares. In the third section were problems involving perfect numbers, problems involving the Chinese remainder theorem and problems involving summing arithmetic and geometric series . Fibonacci sequence. $n^2 + (2n + 1) = (n + 1)2$. no x, y such that $x^2 + y^2$ and $x^2 - y^2$ are both squares and $x^4 - y^4 = z^2$ has no non-trivial integral solutions. Defined the concept of a congruum a number of the form $ab(a + b)(a - b)$, if $(a + b)$ is even and 4-times this if $a + b$ is odd. Proved congruum must be divisible by 24. Showed : for x, c such that $x^2 + c$ and $x^2 - c$ are both squares. Then c is congruum. Proved : squares cannot be a congruum.

Leonhard Euler 1707-1783

Euler wrote around 380 article. He wrote books on the calculus of variations, the calculation of planetary orbits, artillery and ballistics ,,analysis, shipbuilding and navigation, the motion of the moon, Differential calculus. In number theory, worked on fermat primes, and in so doing introduced the Euler pi function. Proved : Fermats last theorem for n=3 . His solution for Basel problem $\pi\frac{2}{6}$. Elementary functions. Studied : bita and gamma functions which he had introduced first in 1729, and ODE and PDE. Discovered : Eulers formula . Proved: $ln(-1) = \pi^i$. Studied : orthogonal trajectories. Rediscovered : C-R equations. Work : on infinite series included Euler constant, calculated to 16 decimal places. Studied : Fourier Series . He was the first to express an algebraic function by such series. Found : Euler- Maclaurin summation formula independently of maclaurin . Considered : Linear equations with constant coefficients. Second ordered DE with variable coefficient. Power series solution of DE . A method of variation of constants. Integrating factors. A method of approximating solutions. When considering vibrating membranes , Euler was led to the Bessel equation which he solved by introducing Bessel functions. Contribution : differential geometry. Investigating : theory of surfaces and curvature of surfaces. Geometry investigations led him to fundamental ideas in topology such as the Euler characteristic of a polyhedron . 1736 published : Mechanica. Developed : kinematics and dynamics of rigid bodies with application of ship-propulsion. 1750 setting up the main formula: continuity equation. Laplace velocity potential equation. Euler equation for the motion of an inviscid incompressible fluid. Work : astronomy. Theory of music. Cartography. Euler notations : $f(x), e, I, \pi, summation,$.

Maria Gaetana Agnesi 1718-1799

Witch of Agnesi.

Marin Mersenne 1588-1648

Investigated : prime number. Tried to find a formula that would represent all primes, he failed. $2p - 1$ investigating of large primes. He claimed that n is prime if p=2,3,35,7,13,17,19,31,67,127 and 257 but composite for other 44 primes smaller than 257. Over the years two that did not lead to prime (67 and 257) and missed three that did (61,89,107).

Nicolo Fontana (Tartaglia) 1499-1557

The first person known to have solved cubic equations algebraically was del Ferro. Fior began to boast that he was able to solve cubics and a challenge between him Tartaglia was arranged. Tartaglia discovered how to solve all cubics, where as Fior had only been taught to solve some, so Tartaglia won easily. Based on Tartaglias formula cardano and his assistant Ferrari made remarkable progress finding proofs of all cases of the cubic, solving quartic equation. 1545 cardano published solutions to the cubic and quartic equations. Contribution : application of mathematics to artillery fire. In the work he described new ballistic methods and instruments, including the first firing tables.

Nicolaus Bernoulli 1687-1759

Worked : on geometry and differential equations. St. Petersburg problem. Showed: $\frac{1}{n^2}$ is $\pi^{\frac{2}{6}}$ which had cofounded Liebniz and Jacob Berrnoulli. Other problems he worked on involved DE . Studied : problem of orthogonal trajectories. Construction of orthogonal trajectories to families of curves. Proved : equality of mixed second-order partial derivatives. Contribution in studying the Riccati equation.

Nicolaus Copernicus 1473-1543

1513 copernican theory. Copernicuss heliostatic cosmology involved giving several distinct motions to the Earth.

Nicole d oresme 1323-1382

Invented : coordinate geometry before Descartes. Credited rules of exponents: $x^m x^n = x^(m+n)$ $(x^m)^n = x^{mn}$. Even more imaginative was his suggestion that irrational powers are possible. Also worked on infinite series. He was the first to prove that the harmonic series diverses. Also opposed the theory of a stationary Earth as proposed by Aristotle and taught motion of the Earth, 200 years before Aristotle. Wrote a work dealing with the nature of light, reflection of light and the speed of the light.

Nicomachus 60?-120?

Wrote introduction to Arithmetic, which was the first work to treat arithmetic as a separate for geometry. Quotes on perfect numbers, states that nth primes has n digits, and that all perfect numbers end in 6 or 8 alternatively. These are false 6,28,496 and 8128. Two volumes : on theology of numbers.

Niels Henrik Abel 1802-1829

Published paper : on functional equations and integrals In one paper he gave the first solution of an integral equation. Worked : on solving quintic equations. 1824 proved impossibility of solving the general equation of the 5th degree in radicals. Proved : Abels theorem. Paper : radically transformed the theory of elliptic integrals to the theory of functions by using their inverse functions. Work : on the algebraic solution of equations was found, including the theorem. If every three roots of an irreducible equation of prime degree are related to one another in such a way that one of them may be expressed rationally in terms of the other, then the equation is soluble in radicals.

Nikolai Ivanovich Lobachevsky 1792-1856

1834 found a method for the approximation of the roots of algebraic equations.

Omar Khayyam 1048-1131

Work : problems of Arithmetic . A book on music . One on algebra. Treatise on Demonstration of problems of algebra.

Pafnuty Lvovich Chebyshev 1821-1894

Work : on prime numbers included the determination of the numbers of primes not exceeding a given numbers. 1849 Wrote an important book on theory of congruences . 1845 Bertrand conjectured: there was always at least one prime between n and 2n for n¿3. 1850 Chebyshev proved Bertrand s conjecture. $\lim_{n \to \infty} (\frac{\pi(n).logn}{n}) = 1$ Proved : lim n. Unable to prove : Existence of the limit. The proof of this results was proved by Hadamard and de la vallee Poussin independently. studied : converting rotary motion in to rectilinear motion by mechanical coupling. chebyshev parallel motion is tree linked bars approximating rectilinear motion . wrote : probability theory . quadratic forms . orthogonal functions. theory of integrals . construction of maps . calculation of geometric volumes.

Paolo Ruffini 1765-1822

1799 published a book on the theory of equations with his claim that quintics could not be solved by radicals. He was the first to introduce the notion of the order of an element, conjucacy, the cycle decomposition of elements of permutation groups and the notions of primitive and imprimitive. Proved : order of a permutation is the least common multiple of the lengths in the decomposition in to disjoint cycles and that S5 has no sub-groups of index 3,4 or 8. 1820 published a scientific article on typhus based on his experience with disease. Wrote on probability.

Pappus 290?-350?

Book I Arithmetic. Book II-deals with Apollonius method for dealing with large numbers. The method for dealing with large numbers. The method expresses numbers as powers of 10,000. Book III: divided in to four parts. First part : Problem of finding two mean proportionals between two given straight lines . Second part : construction of the arithmetic, geometric and harmonic means. Third part : a collection o geometrical paradoxes. Final part : shows how each of the 5-regular polyhedral can be inscribed in a sphere. Book IV: properties of curves including the spiral of Archimedes and the quadratix of Hippias and includes his trisection methods. Book V: 13 semi regular solids(discovered by Archimedes). He compares the area of figures with equal perimeters and volumes of solids with equal surface areas, providing a result due to zenodorus that the sphere has greater volume than any regular solid with equal surface area, the one with the greater number of faces has the greater. volume Book VII : Pappus problem Book VIII : Mechanics Wrote : on music. On hydrodynamics.

Paul Erdos 1913-1996

1850 chebyshev proved Bertrands conjecture. 1896 Hadamard and de la vallee Poussin independently proved the priiime number theorem using complex analysis. Wrote over 1500 papers during his lifetime.

Pirre de Fermat 1601-1665

Produced important work on maxima and minima. Fermat last theorem $x^n + y^n = z^n$ has no non-zero integer solutions for x, y and z when $n > 2$. Fermat is also known for his method of infinite descent. Every positive integer equal to 1 mod 4 was the sum of 2-squares. Find all solutions of $N^2 - 1 = y^2$ for N not a square number , was however solved by Wallis and Brouncker and they developed continued fractions in their solution. Conjectured : there are exactly 2-integer solutions of $x^2 + 4 = y^3$ and $x^2 + 2 = y^3$ has only 1 integer solution.

Pirre-simon Laplace 1749-1827

First paper:on maxima and minima of curves where he improved on methods given by Lagrange. Difference equation. Wrote : on integral calculus. Mechanics. Physical astronomy. Mathematical astronomy. 5-book. Apparent motions of the celestial bodies. The motion of the sea. Atmospheric refraction. Actual motion of the celestial bodies on force and momentum. Theory of universal gravitation and included an account of the motion of the sea and shape of the Earth. Final book : gave an historical account of astronomy and included his famous nebular hypothesis. Discovered :invariability of planetary mean motions. 1786 proved : eccentricities and inclinations of planetary orbits to each other always remain small, constant and self-correcting. 5-volumes : treatise du mechanique celeste on general laws of equilibrium and motion of solids and fluids. Second book : on the laws of universal gravitation and the motions of the centre of gravity of bodies in the solar system. 2-volume: mechanics applied to a study of the planets. Theory of errors. The first editions of the Laplaces Theorie Analyique des

Probabilities. Covering generating functions, approximations to various expressions occurring in probability theory, Laplaces definition of probability. Bayes theorem. Least squares. Buffons needle problem. Inverse probability. Applications to mortality. Life expectancy. The length of marriages. Legal matters.

Plato 427-347 BC

Contribution: philosophy. Mathematics. Science. The fifth platonic solid, the dodecahedron is platos model for the whole universe.

Pythagoras 569-475 BC

Interested : the concept of number . The concept of a triangle. Noticed : vibrating string produce harmonious tones when the ratio of the lengths of the strings are whole numbers. Contributed : Theory of music. Studied : the properties of numbers. Such as even and odd numbers. Triangular numbers. Perfect numbers. Pythagorean theorem. Other mathematics attributed to the Pythagoreans are : the sum of the angles of a triangle is equal to two right angles, a polygon with n sides has sum of interior angles (2n-4) right angles and sum of exterior angles equal to four right angles. Existence of irrational numbers. 5 platonic solids. Solving quadratic equations by geometrical means. And fact that Venus the evening star was the same planet as Venus the morning star.

Rene Descartes 1596-1650

He learnt mathematics from the books of clarius. La Geometri. 1644 Principia Philosophiae was published . It attempts to put the whole universe on a mathematical foundation reducing the study to one of mechanics.

Simeon Denis Poisson 17811840

Work : on definite integrals. His advances in Fourier Series. This work was the foundation of later work in this area by Dirichlet and Riemann. Poisson distribution. Published : 300-400 works including applications to electricity and astronomy. 1811 : Traite de mechanique. Poissons integral. Poissons equation in potential theorem. Poisson brackets in differential theorem. Poissons ratio in elasticity. Poissons constant in elasticity.

Sir Isaac Newton 1643-1727

He began revolutionary advances in mathematics, optics, physics and astronomy. 1671 De Methodis serierum et Fluxionum . Light consists of the motion of small particles rather than waves. Newtons rings . Diffraction of light. Greatest achievement was his work in Physics and celestial mechanic which culminated in the theory of universal gravitation . 1666 : Three laws of

motion. Discovered :centrifugal force on a body moving uniformly in a circular path. Newtons novel idea was to imagine that the Earths gravity influenced the Moon, counter balancing its centrifugal force. From his law of centrifugal force and Keplers third law of planetary motion, Newton deduced the inverse-square law. 1687 : Philosophiae naturalis Principia Mathematica. He analysed the motion of bodies in resisting and non-resisting media under the action of centripetal forces. The results were applied to orbiting bodies, projectiles, pendulums, and free-fall near the Earth. Demonstrated that the planets were attracted towards the sun by a force varying as the inverse square of the distance and generalised that all heavenly bodies mutually attract one another. The eccentric orbits of comets, the tides and their variations, the precession of the Earths axis, the motion of the Moon as perturbed by the gravity of the sun.

Sir Ronald Aylmer Fisher 1890-1962

Theory of errors in astronomical observation. Fisher is considered the founder of modern statistics. 1921 introduced : concept of likelihood. Maximum likelihood estimates. Invented : analysis of variance. Studied : hypothesis testing. Three fundamental problems. Specification of the kind of population that the data came from . Parameter estimation. Distributional problems.

Sir William Rowan Hamilton 1805-1865

Studied : clairauts Algebra. 1822 found an error in one of Laplaces work. 1832 published : a treatise on the characteristic function applied to optics. He applied the characteristic function to study Fresnels wave surface. Read paper to the Royal Irish academy expressing complex numbers as algebraic couples, or ordered pairs of real numbers. After the discovery of algebraic couples, he tried to extent the theory to triplets. 800 papers

Srinivasa Aiyangar Ramanujan 1887-1920

1900 began to work on summing geometric and arithmetic series. 1902 shown : how to solve cubic equations . Find : his own method to solve quartic equation. He calculated Eules constant to 15 decimal places . Independently discovered : Bernoulli number. Worked : on hypergeometric series. Investigated : relations between integrals and series. 1908 Studied : continued fractions. Divergent series. 1910 he developed relations between elliptic modular equations . 1913 wrote to hardy having seen a copy of his 1910 book. Hardy and Littlewood studied : unproven theorem which enclosed with his letter. 1916 he graduated from Cambridge with B.Sc by research. His dissertation was on highly composite numbers and consisted of 7 of his papers published in England. 1918: FCPS, FRS. He worked out the Riemann series, the elliptic integrals , hyper geometric series, functional equations of Zeta-function. Independently discovered results of Gauss, Kummer and others on hyper geometric series. Work : $P(n)$ partitions of an integer. Joint paper with Hardy-Ramanujan. Gave an asymptotic formula for $p(n)$. G.N.Watson published 30 papers which were inspired by Ramanujans work.

Stanislaw Marcin Ulam 1909-1984

He developed Monte-Carlo method.

Stefan Banach 1892-1945

1918 the paper, his first appeard. 1920 : Banach space. Contribution : systematic theory of functional analysis. He wrote arithmetic, geometry and algebra texts for high schools. 1929 : together with Steinhaus started a new journal studia Mathematica. 1931 : new series of Mathematical Monographs founded : Modern functional analysis. Contribution : theory of topological vector spaces . Measure theory. Integration. The theory of sets. Orthogonal series. Proved : number of fundamental results on normed linear spaces. Hahn-Banach theorem on the extension of continuous linear functional. Banach-Steinhaus theorem on bounded families of mappings. Banach-Alaoglu theorem. Banach fixed point theorem. Banach-Tarski paradoxical decomposition of a ball.

Stephen Smale 1930-

Showed : any closed n-dimensional manifold which is homotopy equivalent to the n-sphere must be the n-sphere when n is at least 5. Michael Freedman proved the conjecture for n=4 in 1982 but the original conjecture remains open. Contribution : Morse theory. Generalized Poincare conjecture. Discovered : strange attractors. The n-body problem and electric circuit theory were among the applications that samale framed in the language of dynamical systems.

Thales 624 -747 BC

585 It is reported that Thales predicted an eclipse of the sun. The cycle of about 19 years for eclipses of the Moon was well-known but the cycle for eclipses of sun was harder to spot since eclipses were visible at different places on Earth. Discovered : Height of pramids. Shadow of the pramids at the time when any bodys height and its shadow are equal in length.

Theatetus 417-369 BC

Books 10 and 13 of Euclids Elements are almost certainly a description of Theatetus work. Given two magnitudes a and b, then medial is ab, binomial is a+b, apotome a-b. Who assigned the medial line to geometry, binomial to arithmetic, apotome to harmony.

Thomas Jan Stieltjes 1856-1894

Worked on : almost all branches of analysis, continued fractions, number theory. He is often called the father of the analytic theory of continued fractions. Stieltjes integral. 1916 : gave the first example of an absolutely normal number. Borel had proved such numbers exist but Sierpinski was the first to give an example. Journal : Fundamental Mathematica. Contribution : ODE and PDE, Gamma functions, interpolation, elliptic functions.

Waclaw Sierpinski 1882-1969

1904 : contribution: famous problem on lattice points. 1916 : gave the first example of an absolutely normal number. Journal :Fundamenta Mathematica. Continuum hypothesis. Work : on functions of a real variable include results on functional series, differentiability of functions, Baires classification. Sierpinski was the author of the incredible number of 724 papers and 50 books.

Wihelm Ackermann 1896-1962

Recursive function. Ackermanns function.

William Paul Thurston 1946-2012

1972 Thesis : Foliations of 3-manifolds. Riemanns uniformization theorem. Kleinian groups were first studied by Poincare and a fundamental finiteness theorem was proved by Ahlfors.

Zeno 490-425 BC

40 paradoxes concerning the continuum. In the paradox named The Dichotomy.
Zeno says : There is no motion because that which is moved must arrive a the middle of its course before it arrives at the end. In The Arrow, zeno argues: If everything is either at rest or moving when it occupies a space equal to itself Zenos argument (The Achilles): The slower when running will never be overtaken by the quicker.

Opera Omnia [73 volumes of collected papers and 886 books and articles]

E001 and E003-Concerned with the isochrone and brachistochrone problems. E002-Dissertation on sound . E005-Concerned with curves that intersect orthogonally. E006-Concerned with the involute of the circle. E007-Attempt to explain atmospheric phenomena in terms of air vesicles, fine matter, and centrifugal force. E008-General solution of heavy planar curves under various lading, catenaries, sails, etc. E009-Shortest curves joining two points on a surface. E010-Exponential to the Differential equation. E012-Geometric condition for tautochronic curves and then shows how to generate such a curves, both analytic and algebraic, starting from the familiar cycloid. E013-Extends the analysis to a resistive medium where the resistance is in proportion to the square of the speed. E014-Elementary treatment of finding the pole star from three measurements on a star over time. E015-Mechanica vol. I. E016-Mechanica vol.II. E019-Euler explores transcendental progression in which the general terms are infinite products related to quotients of factorial relating initially to the Wallis product for ,and in which integrals are formed for the general terms; a derivative of the half-derivative is given finally as a final consequence. E020-Summation of transcendental progressions in which the general terms are generally derived for the familiar G.P; sum of the inverse squares of integers. E021-Investigates

a possible timing mechanism for a clock, in which two weights unwind from curves attached to a pulley. E022-Straight line collision of two bodies and determines the laws of conservation of linear momentum. E025-Summation of series. Series can be summed using integrals and differential to reduce a sum to a geometric series [summing hyper-geometric series]. E026 and E054-Providing answers to two of the questions posed Fermat. Firstly discrediting of Fermats formula for primes . Secondly establishment of Fermats Little Theorem. E031-New method of solving I-order Differential, as applied to the Riccati Equation. E041- Basel Problem. E044-Method for finding a family of curves arising from the constant of integration of $dz = Pdx$. E248-The Archimedes Screw. Kinematic model for the movement of water up or down the spiral. E278-The Mechanics of solid or Rigid bodies vol.I and vol.II. E842-An Introduction to Natural Science, Thoughts of the Elements of the bodies. E305-Propagation of sound in one dimension. E306-Extends the propagation of sound to two and three dimension. Deriving the wave equation in Differential form for waves propagating in two and three dimension. E307-Ricattis method can be used to integrate the 3-Dimensional equation he has derived for the propagation of sound. E524-Spherical Trigonometry all derived briefly and clearly from first principles. E736-Concerning summation of Infinite series. E478-Rotation of any rigid body. E698-Results relating to Spherical triangles. Lexells paper on Spherical Triangles. Lexells paper on the Motion of a Rigid Body.

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